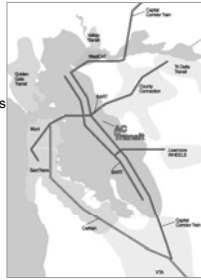


ACT Regional Role

AC Transit's
HyRoad®
Development
Program

- > One of 14 transit operators
- > SF Muni
- > Bart (Capitol Corridor)
- > AC Transit
- > VTA
- > Samtrans
- > Caltrain
- > Golden Gate
- > County Connection
- > ACE
- > Wheels, Tri Delta, Vallejo, WestCAT



Service Program

AC Transit's
HyRoad®
Development
Program

- > Serving 1.5 million people (13 cities) in the East Bay of the SF Bay Area (350 square miles)
- > 68 million passengers
- > 696 buses
- > 2,302 employees
- > \$250 million budget
- > 105 lines [27 transbay]
- > 6,500 bus stops

2



○ H2
Facilities



The Potential!

AC Transit's
HyRoad®
Development
Program

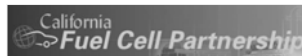
- > ZEBus Test – Nov 1999
 - > \$9 million bus
 - > 75 mph road test
 - > Negotiated 12% grades
 - > Revenue service on Congested Routes
- > Membership in California Fuel Cell Partnership – Jan 2000
- > Challenge: Demonstrate commercial viability for transportation industry



Partnering

AC Transit's
HyRoad®
Development
Program

- > Bus Demonstrations
 - > AC Transit
 - > Sunline Transit
 - > Valley Transportation Authority (VTA)



www.cafcp.org



Why Transit?

AC Transit's
HyRoad®
Development
Program

- > **An Ideal Test Bed**
 - > **Testing the limits:** fuel cell performance under heavy-duty, rigorous operating conditions (**Reliability and Durability**)
 - > Operate vehicles on fixed routes in congested urban **stop-and-go duty cycles**
 - > **Centralized** maintenance and fueling
 - > **Professional** staff and training
 - > Excellent visibility and extensive public **exposure**



What's In It For Us – We're a Public Service Agency?

AC Transit's
HyRoad®
Development
Program

- > **Health:** Zero-emissions – only vaporized water or steam
- > **Quality of Life:** Quiet, durable electric-powered motors – improved duty cycle and **reduction in life cycle costs**
- > Potential use of **renewable** and **sustainable** sources of energy (solar, wind, hydro, biomass)
- > **Energy independence** and economic stability (reduced dependency on petroleum imports)
- > Reduction in carbon emissions and greenhouse gases (**reduce global warming**)



Funding An R&D Program

AC Transit's
HyRoad®
Development
Program

- > \$20 Million Demonstration Project
- > \$23 Million PM Responsibilities
- > Funding Sources
 - > Caltrans
 - > California Air Resources Board
 - > ChevronTexaco
 - > Bay Area Air Quality Management District
 - > DOT/Federal Transit Administration
 - > California Energy Commission
 - > Department of Energy
 - > Stuart Energy
 - > CalSTART



Employee Development

AC Transit's
HyRoad®
Development
Program

- > Maintenance Apprenticeship Program
 - > Only state-certified heavy-duty apprenticeship program in U.S.
 - > 186 mechanics (90 apprentices)
 - > Hydrogen training component under development (working with SunLine Transit)
- > Introduction and Orientation
 - > Hydrogen training for 2,302 employees



Duty Cycle (1)

AC Transit's
HyRoad®
Development
Program

- > Evaluate performance factors and life cycle costs using three buses, operating on four types of routes with different duty cycles
 - > Hill routes (grades in excess of 17%)
 - > Transbay freeway express routes (65 mph)



Duty Cycle (2)

AC Transit's
HyRoad®
Development
Program

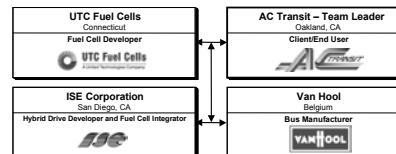
- > Three buses will help differentiate systemic events from random events
 - > Heavy-duty urban trunkline routes in congested stop-and-go traffic (20,000+ riders/day)
 - > Neighborhood feeder routes



Working Together from The Ground Up

AC Transit's
HyRoad®
Development
Program

>Model Development Team



Bus Specifications

AC Transit's
HyRoad®
Development
Program


- > Hybrid-Electric Drive System
- > 120 kW Fuel Cell
- > Energy Storage: Three Zebra Nickel Sodium Chloride Batteries (100 kW)
- > 65 mph Maximum Speed
- > Hill Climbing: 18% grade
- > 250 mile range
- > Three Buses for AC Transit (September 2005)
- > One Bus for SunLine Transit (assembled at AC Transit)



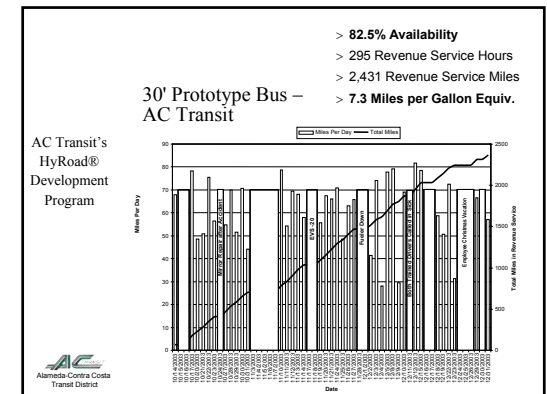
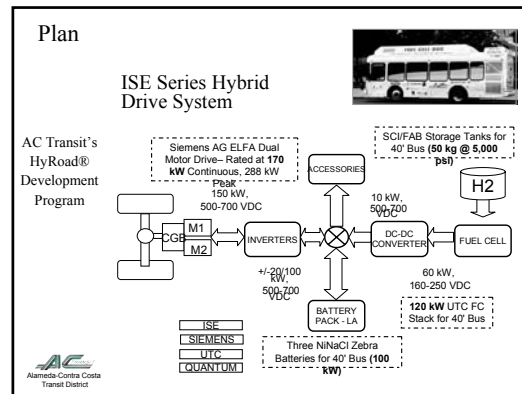
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Development
Program

YANHOOL

The Hydrogen Fuel Cell Bus Glider




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Alameda-Contra Costa
Transit District



AC Transit's
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Development
Program

DOE Light Duty Demonstration

- > 10 Hyundai Tucson Fuel Cell SUVs, 2005 – 2009
- > Operated by AC Transit Road Supervisors



ChevronTexaco

HYUNDAI


UTC Fuel Cells
A United Technologies Company

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Alameda-Contra Costa
Transit District

AC Transit's
HyRoad®
Development
Program

Richmond
Station

- > Startup – October 2002
- > Produces 24kg/day of hydrogen by electrolyzing water; 47kg of storage
- > Fuels 30' prototype bus and light duty vehicles
- > In cooperation with the California Fuel Cell Partnership and Stuart Energy



stuart energy

California Fuel Cell Partnership
Accelerate the Fuel Cell

AC
Alameda-Contra Costa
Transit District

AC Transit's
HyRoad®
Development
Program

Lessons Learned

- > Approval Process – 7 to 8 months
- > Installation and Operating Permit – 4 to 5 months
- > Facility Training with First Responders (90+)
- > Solicited Political Support Early On
- > Meeting with West County Toxic Coalition
- > Outreach to Nearby Residents
- > Town Hall Meeting
- > Public Hearing Support (Limited Opposition)
- > Utilized Presentations, Fact Sheets, Tours, Direct Mail, Support of "Experts," and Previous Examples
- > Staged Media Event at Opening (200 people)

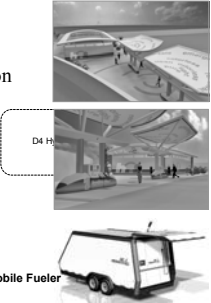


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AC Transit's HyRoad® Development Program




Oakland Energy Station

- > Well to Wheel – Fleet Applications: Onsite steam reforming of natural gas
- > 150 kg/day
- > Co-generation capability; mobile fueler (100 kg)
- > Scheduled completion – August 2005
- > Built in cooperation with ChevronTexaco
- > Maintenance facility designed by **Nexant**



D4 H


Mobile Fueler


AC Transit's HyRoad® Development Program

Lessons Applied (1)

- > **Start Early**
- > **Establish "Ownership"**
- > **Reach All Stakeholders in Parallel**
 - > Internal (2,300 Employees)
 - > Public Officials, Staff, AHJ, and First Responders
 - > Labor
 - > Community
- > **Involve the Community**
 - > Key Individuals
 - > Neighborhood Groups
 - > Schools, Churches, Youth/Senior Organizations
 - > Civic Groups
 - > Community Organizers/Environmental NPOs




On the Street with Six Graders




AC Transit's HyRoad® Development Program

Lessons Applied (2)

- > **Control Expectations with Good PR and Media**
- > **Outreach Tools**
 - > Presentations (Speakers' Bureau)
 - > Fact Sheets
 - > Vehicles (Traveling Exhibits)
 - > Videos (Series of 4)
 - > Internet
 - > Direct Mail
 - > Town Hall Meetings
 - > Tours/Parades/Festivals
 - > Technical Support from "Experts" and Officials







Learning Center (curriculum)



AC Transit's HyRoad® Development Program

Credibility through Evaluation





- > AC Transit developed program with NREL and UC Davis
- > Vehicle performance/institutional challenges/public acceptance
- > Remote Data Collection with Internet access
- > Bridging the gap between the "cultures" of diesel and fuel cells

AC Transit's HyRoad® Development Program

Reaching the Public

- > Speakers' Bureau
- > DOE \$2.7 million Curriculum Grant with LHS/SERC/Chabot/NHA
- > Publications and videos
- > Internet education
- > HyRoad® Learning
- > Mini-bus

AC Transit's HyRoad® Development Program

Tracking Our Progress

- > www.actransit.org/onthehorizon/fuelcell.wu

